

*et seq.*

*Sub E.*

I Claim:

1. In a batch liquid purifier having a generator outputting an ozone-containing gas merged during a purification operation with liquid flowing in a passageway from a liquid batch container to a purified liquid dispenser, an improvement comprising:
  - a. admission of untreated liquid to the passageway being blocked when the purifier is not operating;
  - b. a pumping system that operates when the purifier is operating to admit untreated liquid to the passageway, to flow liquid through the passageway, and to mix the ozone-containing gas with the liquid flowing in the passageway to dissolve the ozone in the liquid;
  - c. the liquid passageway downstream and adjacent to the mixing of the ozone-containing gas with the liquid being formed as an upflow chamber in which bubbles of the ozone-containing gas rise within and to the level of an initial flow of liquid rising in the upflow chamber at the beginning of a purification cycle; and
  - d. the liquid flow passageway downstream of the upflow chamber being configured to ensure sufficient contact between ozone and the liquid to purify the liquid before it reaches the dispenser.

*40* 2. The improvement of claim ~~1~~ <sup>39</sup> including a light-transmitting wall of the upflow chamber making bubbles visible as they rise within the chamber.

*41* 3. The improvement of claim ~~2~~ <sup>40</sup> including an illuminator arranged for enhancing the visibility of the rising bubbles.

*42* 4. The improvement of claim ~~2~~ <sup>40</sup> wherein the light-transmitting wall is colored.

*43* 5. The improvement of claim ~~2~~ <sup>31</sup> wherein the generator operates before liquid flows in the passageway.

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- 44 8. The improvement of claim ~~1~~ including a filter for the liquid being dispensed and an indicator showing a need to change the filter.
- 45 9. The improvement of claim ~~8~~ wherein the indicator is responsive to an extent of operation of the purifier.
- 46 10. The improvement of claim ~~1~~ including a mixer in the liquid passageway.
- 47 11. The improvement of claim ~~8~~ including a mixer upstream of the upflow chamber and a mixer downstream of the upflow chamber.
- 48 12. The improvement of claim ~~1~~ including a constriction in an air flow through the generator enabling the pumping system to draw liquid from the container.
- 49 13. The improvement of claim ~~1~~ including a pump protector arranged for stopping liquid pumping after the container is empty.
- 50 14. The improvement of claim ~~1~~ including an air pump connected to the liquid passageway and arranged to help empty the liquid passageway of liquid after a purification cycle.
- 51 15. The improvement of claim ~~12~~ including a liquid sensing system arranged to control the air pump.
- 52 16. The improvement of claim ~~1~~ wherein the liquid dispenser includes a movable spout that can be extended beyond a housing of the purifier.
- 53 17. The improvement of claim ~~14~~ wherein extending the spout activates the purifier and retracting the spout deactivates the purifier.
- 54 18. The improvement of claim ~~14~~ including a switch that blocks dispensing unless the spout is extended.

~~55~~ 17. The improvement of claim ~~1~~ including a gas-liquid separator arranged in the liquid passageway upstream of the dispenser.

~~56~~ 18. The improvement of claim ~~1~~ including a valve upstream 5 of an outlet of the dispenser arranged for closing the dispenser outlet when liquid is not being dispensed.

~~57~~ 19. The improvement of claim 1 including a desiccant and a valve upstream of the ozone generator arranged so that the valve opens an inlet to the desiccant only when air flow enters the 10 generator during operation.

~~58~~ 20. The improvement of claim ~~1~~ wherein the container is detachable from the purifier.

~~59~~ 21. A method of purifying a batch of liquid with ozone from a generator producing an ozone-containing gas that is mixed with the 15 liquid in a passageway extending from an untreated liquid container to a purified liquid dispenser, the method comprising:

- a. after mixing the ozone-containing gas with liquid flow commencing at the beginning of a batch purification cycle, directing the liquid and ozone mixture into an upflow chamber in which the initial flow of liquid rises as bubbles of ozone-containing gas rise at a faster rate to overtake the preceding liquid; and
- b. blocking entry of untreated liquid into the passageway except when the purifier is purifying liquid flow.

25 22. The method of claim ~~21~~ including illuminating the upflow chamber to make the rising bubbles visible.

3 23. The method of claim ~~21~~ including coloring a viewing wall of the upflow chamber through which the rising bubbles are visible.

4 24. The method of claim ~~21~~ including starting the ozone 30 generator before starting the liquid flow.

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- 5      25. The method of claim ~~21~~ including configuring the liquid and ozone flow downstream of the upflow chamber to ensure sufficient ozone contact with the liquid to purify the liquid before it reaches the dispenser.
- 5      26. The method of claim ~~21~~ including constricting air flow through the generator to enable a pumping system to cause the liquid flow.
- 7      27. The method of claim ~~21~~ including stopping a liquid flow pump after the liquid is no longer flowing.
- 10     28. The method of claim ~~21~~ including mixing a liquid and gas flow in the passageway.
- 9      29. The method of claim ~~21~~ including pumping air into the liquid passageway to help empty the liquid passageway after a purification cycle.
- 15     30. The method of claim ~~21~~ including indicating a need to change a filter upstream of the purified liquid dispenser.
- 11     31. The method of claim ~~30~~ including basing the filter change indication on an extent of purifier operation.
- 12     32. The method of claim ~~21~~ including separating gas from the purified liquid downstream of the upflow chamber.
- 13     33. The method of claim ~~21~~ including dispensing purified liquid through an extendible dispensing outlet.
- 25     34. The method of claim ~~33~~ including activating liquid purification upon extending the dispenser outlet and deactivating liquid purification upon retracting the dispenser spout.
- 15     35. The method of claim ~~33~~ including closing the dispensing outlet except when purification is occurring.
- 16     36. The method of claim ~~21~~ including blocking an air inlet to a desiccant upstream of the generator except when air is drawn into the generator.

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21. The method of claim ~~38~~ including blocking liquid flow unless the dispensing outlet is extended.
18. The method of claim ~~21~~ including making a container for untreated liquid detachable from a purifier of the liquid.
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*sub D3*
21. A liquid purifier combining an unpurified liquid batch container, a liquid flow passageway leading from the container to a purified liquid outlet, a generator producing an ozone-containing gas, and a pumping system flowing the liquid through the passageway and combining the ozone-containing gas with the liquid to purify the liquid en route to a dispensing outlet, the purifier comprising:
- 10 a. the liquid passageway downstream of a region where the ozone-containing gas joins the liquid being formed into an upflow chamber in which a leading flow of the liquid rises at a rate exceeded by a rate of rise of bubbles of the ozone-containing gas within the liquid so that the ozone-containing gas overtakes the leading liquid flow; and
- 15 b. the liquid passageway includes ozone and liquid mixing and a liquid flow configuration that ensures purifying contact of the liquid with ozone before the liquid reaches the dispensing outlet.
- 20 20 19
20. The purifier of claim ~~20~~ wherein a wall of the upflow chamber transmits light and makes the rising bubbles visible.
- 21 20
- 25 41. The purifier of claim ~~40~~ including an illuminator enhancing the visibility of the rising bubbles.
- 22 20
26. The purifier of claim ~~40~~ wherein the light-transmitting wall of the upflow chamber is colored.
- 23 19
28. The purifier of claim ~~29~~ including a barrier to entry of the liquid into the passageway before the pumping system operates.
- 24 19
- 30 44. The purifier of claim ~~29~~ wherein the ozone generator operates before liquid flows in the passageway.

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46. The purifier of claim ~~30~~ including a mixer upstream of the upflow chamber.

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46. The purifier of claim ~~30~~ including a constriction in a flow of air through the generator enabling the pumping system to draw liquid from the container.

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47. The purifier of claim ~~29~~ including a pump controller arranged for stopping a liquid pump after liquid stops flowing to the pump.

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48. The purifier of claim ~~29~~ including an air pump connected to the liquid passageway and arranged to help empty the liquid passageway of liquid after a purification cycle.

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49. The purifier of claim ~~48~~ including an air pump controlling system responsive to liquid in the passageway for turning the air pump on and off.

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50. The purifier of claim ~~29~~ wherein the dispensing outlet is closed when purified liquid is not being dispensed.

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51. The purifier of claim ~~29~~ wherein the dispensing outlet includes a movable spout that can be extended beyond a housing of the purifier.

32 31  
52. The purifier of claim ~~51~~ wherein liquid flow is blocked unless the spout is extended.

33 31  
53. The purifier of claim ~~51~~ including a system for starting and stopping the purifier respectively in response to extension and retraction of the dispensing outlet.

34 19  
54. The purifier of claim ~~30~~ including a gas-liquid separator arranged in the liquid passageway downstream of the upflow chamber.

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55. The purifier of claim ~~29~~ including a mixer downstream of the upflow chamber.

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56. The purifier of claim 39 including a valve upstream of a desiccant in an air inlet to the generator for preventing moist air from entering the desiccant except when air is drawn into the generator during operation.

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5 57. The purifier of claim 39 wherein the container is detachable from the purifier.

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